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## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:

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PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year) 11 MAY 2004 (11.05.2004)Applicant's or agent's file reference  
FGPE04-001FOR FURTHER ACTION  
See paragraph 2 below

International application No.

PCT/KR2004/000153

International filing date (day/month/year)

29 JANUARY 2004 (29.01.2004)

Priority date (day/month/year)

29 JANUARY 2003 (29.01.2003)

International Patent Classification (IPC) or both national classification and IPC

IPC7 C09K 11/59

Applicant

KOREA RESEARCH INSTITUTE OF CHEMICAL TECHNOLOGY et al

## 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

## 3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR



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WRITTEN OPINION OF THE  
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International application No.

PCT/KR2004/000153

## Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material  
☐ in written format  
☐ in computer readable form
  - c. time of filing/furnishing  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2004/000153

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Claims	1-18	YES
	Claims		NO
Inventive step (IS)	Claims	14-18	YES
	Claims	1-13	NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims		NO

**2. Citations and explanations :**

Reference is made to the following documents:

D1: US 5,068,055 A

D2: WO 98/42798 A1  $\Rightarrow$  USPN 6,093,346 is counterpart

D3: US 5,023,015 A

D4: US 6,255,670 B1

**1. Novelty**

Claims 1, 2 and 14 relate to a strontium silicate phosphor having the formula:  $\text{Sr}_{2-x}\text{SiO}_4\text{:Eu}_{2+x}$  ( $x$  is  $0.001 \leq x \leq 1$ ); a preparation method thereof comprising the steps of mixing strontium carbonate, silica and europium oxide, and drying and heat-treating the mixture; and a white light-emitting diode chip containing said phosphor. Said claims are different from D1-D3 in that D1-D3 contain boric acid or magnesium instead of silica as a phosphore base material. D4 includes two or more elements such as europium and neodymium as an activator. Accordingly, said claims are also different from D4 in the method of preparing a phosphor and the configuration of a diode chip containing said phosphor.

Therefore, independent claims 1, 2 and 14 are considered to be novel (PCT Article 33(2)), and claims 3-13 and 15-18 which refer to claims 1, 2 and 14 are also considered to be novel.

**2 Inventive Step**

D1, D3 and D4 describe a method for preparing a boric phosphor comprising the steps of mixing strontium carbonate, boric acid and europium oxide, and drying and heat-treating the mixture. Accordingly, the present application is different from said documents in the constituent element of a base material, that is, in the composition of a phosphor containing silica. However, D2 describes a method for preparing a silicate phosphor by mixing silica and magnesium with strontium. In addition, there is no difference between the present application and D1, D3 and D4 in the drying temperature and time and in the heat-treatment temperature and time.

(continued on supplemental sheet)

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International application No.

PCT/KR2004/000153

**Supplemental Box**

## Continuation of:

Accordingly, the strontium carbonate phosphor and the preparation method thereof claimed in claims 1-13 can be readily invented from said prior art. But claims 14-18 are different from the prior art in that the strontium carbonate phosphor is formed in the outer portion of a diode and molding-treated by a resin, and in the effect of a white light-emitting diode chip having a wide wavelength range.

Therefore, claims 1-13 are considered to lack an inventive step (PCT Article 33(3)), but claims 14-18 are considered to involve an inventive step.